7 November 1962

MEMORANDUM FOR: Chief, Technical Plans & Development Staff

THROUGH : Executive Secretary, TDC

SUBJECT : Staff Study - HTA/5 Film Processor

1. PROBLEM

It has been directed that NPIC will have the necessary instrumentation in Building 213 to process and duplicate original negative input materials on those occasions when the work load throughout the community and contractor facilities necessitate this operation.

2. FACTS

Toward this end a survey was conducted on all existing continuous film processors. All existing equipment was found to have one or more basic flaws when the input materials were original and irreplaceable. Continuous roller film processors may be divided into two categories: (1) spray technique and (2) immersion technique. These two techniques have their own peculiar advantages and disadvantages. For instance, a processor which utilizes the spray technique is smaller and more compact and the very high degree of agitation effected by the spray method when incorporated with high temperatures of the solution results in a fairly rapid processing rate in lineal feet per minute. The disadvantages to this system are the high oxidation rate, the uneconomical use and reuse of the chemical solutions, and the extremely accurate drive speed required for repeatability. A device which utilizes the immersion principle is generally much larger in the physical proportions requiring more installation space, processes at a slower rate in lineal feet per minute, and requires a large volume of chemical solutions for the initial set up with a fairly low replenishment rate. In all of the existing equipment investigated using one or both of these techniques one common fault prevailed. This basic fault is that the film alternately comes in contact with a conventional roller assembly on the base and emulsion sides of the film material. Several conventional methods are employed to transport the film through the processor and dryer. During the processing cycle the film alternately expands and contracts in the linear dimensions due to its environment in an alkaline-acid environment and again from its dry to wet to dry environment. During

the processing cycle a number of changes occur in the tension on the film as measured in foot pound per width inch of the material. Since the roll film when cut from the master roll is not perfectly straight, tracking problems throughout the processor are incurred and are overcome by varying amounts of tension in conventional equipment. These conventional equipments require considerable operator attention, necessitated almost entirely by the tracking problem. The processing of relatively short lengths of roll film (50 to 100 feet) become extremely uneconomical due to the volume of chemicals and/or the man hours involved. The combining of several short lengths of film necessitate a running splice on the processor which is extremely difficult, if not impossible, to effect accurately enough to prevent additional tracking problems. A tear in the film or the rupture of a splice during processing creates nothing short of panic in the photographic laboratory and ultimately results in the loss of considerable footage of irreplaceable materials.

3. DISCUSSION

STATOTHR Recently at the SPSE meetings in Boston, Massachusetts, a film processor was exhibited by [redacted] a subsidiary of [redacted] This film processor completely eliminates all of the problems and objections listed in Item 2 above and combines all of the best features of spray and immersion processing while incurring none of their disadvantages. The proposal, which is attached, was solicited from [redacted] and has been presented to the TDC and received unanimous approval. This proposal has been ammended to contain certain sensitometric data which was omitted initially and these changes have been agreed to by the contractor. These changes in essence specify the processing and drying rates of certain original and duplicate film materials used by NPIC. The contractor has agreed to a fixed price contract with delivery of the prototype instrument 180 days from receipt of contract. Tentative arrangements have been made to make a performance test of the prototype instrument at the contractor's site. The processor would then be dismantled, shipped to March AFB, reassembled and field tested for a period of 20 days. The prototype instrument would then be returned to the contractor for changes and alterations resulting from this field test. The processor shall be designated as the HTA/5 film processor.

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4. CONCLUSIONS

The HTA/5 film processor represents the first major advance in equipment design during the past 20 years. The design objectives are to produce a film processor which requires very little maintenance, very little operator attention, extremely high reliability factor, accurate repeatability, and very low panic factor. Simplicity in

design and ease of operation will inspire the operator's confidence. The modular construction will permit easy transport and assembly in remote areas. The liquid/air bearing principle is the exclusive property of [redacted] Corporation. It is this design characteristic which enables the film to be transported through the processor and dryer from dry to dry without being contacted by a conventional roller assembly.

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5. RECOMMENDATIONS

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It is recommended that NPIC negotiate a contract with [redacted] for $95,480.00, firm price, with completion 180 days from receipt of contract or authority to proceed on the prototype instrument. It is recommended that this instrument be given a preliminary test at the contractor's site after which it will be dismantled by the contract monitor and shipped to March AFB and reassembled by the contract monitor for an extensive field test with live materials at that installation. During the field test of approximately 20 days, knowledgeable persons within the community will be invited to inspect the equipment at March AFB. Their observations, comments and recommendations, together with the experience gained during this testing period, will be carefully analysed and those changes, major and minor, which would improve the performance of the instrumentation will be incorporated in any production units. The prototype unit would then be returned to the [redacted] for changes and/or modifications. Upon completion of these changes the modified instrument would then be installed in Building 213. This equipment would then provide compliance with the directive that NPIC have the capability for processing original input materials.

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[redacted]

Specifications for Richards Model CT-4R Microfilm and Tape Cleaning Machine

1. General

The Richards Model CT-4R Microfilm and Tape Cleaning Machine is specifically designed for gentle and thorough cleaning of high quality films and tapes from 1/4" through 4". It uses the proven principles developed in the Richards Model CT-11R(.5) Photographic Film Cleaning Machine now used with the finest aerial photographic films up to 9 1/2" wide. Different widths of film in this area require specific film transport mechanisms. Width should be so stated when ordering.

Basically, film and tape cleaning is a major step in a preventive maintenance schedule, with the intent of preserving the original data in its best condition for prolonged periods of use. Our equipment provides all the essential factors of an ideal system for this purpose. The cleaning machine uses an immersion wash in an ultrasonic cleaning tank with a safe, non-toxic solvent; a positive rinse with freshly filtered solvent containing no particles over 0.5 microns; a gentle drain system to remove about 90% of the residual solvent by capillary action; and finally, an evaporative drying system which leaves no visible residues. The film or tape drive system is designed for ease of threading, low rates of acceleration and deceleration, and smooth control of film speed and tension throughout the entire roll. The solvent used is Freon TF (duPont) with special additives for improved detergency and residual anti-static action. Particular attention has been given to interlocking the systems to prevent damage to the product or the equipment through component malfunction or operator error.

2. Film Drive

The film drive system employed in this unit is designed to provide extremely gentle handling of the film throughout the cycle. The reel of film to be cleaned is placed on the lower spindle, and the foot pedal is depressed to lower the cleaning tank for film threading. The film is then threaded around the rollers shown and brought around to the take-up reel located on the top spindle. The slack is taken up by manually rotating the reels, the foot pedal is released to return to cleaning position.

To start the cleaning cycle, the "Drive" button is pressed, and the drive mechanism starts to run at a low speed (approximately 10 ft./min.). When the operator has observed that the film is tracking correctly and that the film tension is proper, he closes the door of the machine. When the door closes, the machine shifts into the selected speed range (90 - 150 ft./min.) and automatically maintains the selected speed and

tension until the reel of film is finished.

If the film breaks during the run due to a faulty splice or other cause, the drive will stop automatically. The machine also stops automatically at the end of a reel.

Film drive is by means of a torque motor on the take up reel and a drag clutch on the supply reel, with tachometer generator to regulate linear speed, and a tension sensing roller to control the strain on the film within safe limits. The system is intentionally designed to have low acceleration rates to prevent jerking of the film.

3. Solvent System

The cleaning solvent is handled in a semi-closed system to keep solvent losses to a minimum. As previously described, this equipment uses Freon TF solvent with additive ingredients to provide detergency and anti-static qualities. Because of the inherent stability of Freon TF in ultrasonic equipment, it is not necessary to use inhibitors as required with some other solvents which are not stable in ultrasonic systems. There is no danger of breakdown components from the solvent causing damage to either the film or the equipment, in this machine. The other properties of selective solvent action, very low toxicity and ability to recondition by simple distillation, make Freon TF the best choice of solvent for this purpose.

The machine is designed to fill from a solvent supply drum adjacent to the machine through a built-in fill and drain pump. The cleaning tank is automatically filled to working level and replenished as solvent is used up.

Automatic draining is provided by the same pump either into a separate drum for distillation of contaminated solvent, or back into the supply drum for re-use.

A circulating pump provides metered flow of solvent through the refrigeration heat exchanger, the 0.5 micron filter and the "liquid knives" to maintain the solvent temperature, cleanliness and rinsing action correctly at all times. Pressure and flow-rate monitors warn when a filter change is required or a malfunction occurs. Solvent is circulated only while film is actually being cleaned.

The "liquid knife" principle is an exclusive development for film clean-

ing. This method utilizes a thin flat sheet of freshly filtered solvent directed at low incident angle over each side of the film as it emerges from the ultrasonic tank. The rinsing action removes contaminated solvent and loosened soils from the film and aspirates most of the remaining solvent from the film, leaving it in a semi-dry condition.

4. Ultrasonic System

The auto-tuning ultrasonic system used in this machine adjusts the ultrasonic frequency automatically to the resonant frequency for a given load in the tank and the liquid level, thus maintaining optimum cleaning conditions. This unit is equipped with a 300 watt (1200 watt peak power) ultrasonic generator matched to a transducerized tank having a power level of about 110 watts/gallon. This is a medium power level which will do a thorough job of cleaning, but will not damage the most sensitive tapes or film. Ultrasonic power turns on when system shifts into full drive, and cuts off when the drive stops.

5. Drying System

Film drying is the heart of a cleaning system. The drying system we have developed and used very successfully with the most sensitive aerial films is employed in this machine. The "liquid knives" previously described are the first stage of this drying process. The second stage of drying employs brushes of a very soft, special nylon filament which form a multiple capillary drain path to draw off all but a very thin coating of solvent. The remaining solvent film is evaporatively dried in an air column of slow moving air filtered to remove 99.8% of all particles over 0.3 micron.

The studies of this drying system show that the brushes do not actually contact the film surface, but rather are floated on a thin solvent film at all times, thus precluding any scratch damage. Secondly, the use of a soft air flow for evaporative drying eliminates any flutter problem or danger of embedding particles contained in high velocity air drying systems. Detailed studies under 400x magnification show no traces of visible particles or contaminants remaining on the film from evaporative drying. This system has been thoroughly proven and evaluated on the highest quality aerial films as a safe and thorough method.

6. Size and Weight

The Model CT-4R is self-contained in a cabinet measuring 40" wide,

25" deep and 80" high. Access to the film cleaning zone is by a front door. Access to the electrical components for the film drives, ultrasonic system and fluid system is by a rear door to the upper section of the machine. Access to the fluid filter, pumps, and refrigeration system is by the lower rear door.

Weight of this unit is approximately 700 lbs. net; 950 lbs. crated for shipment.

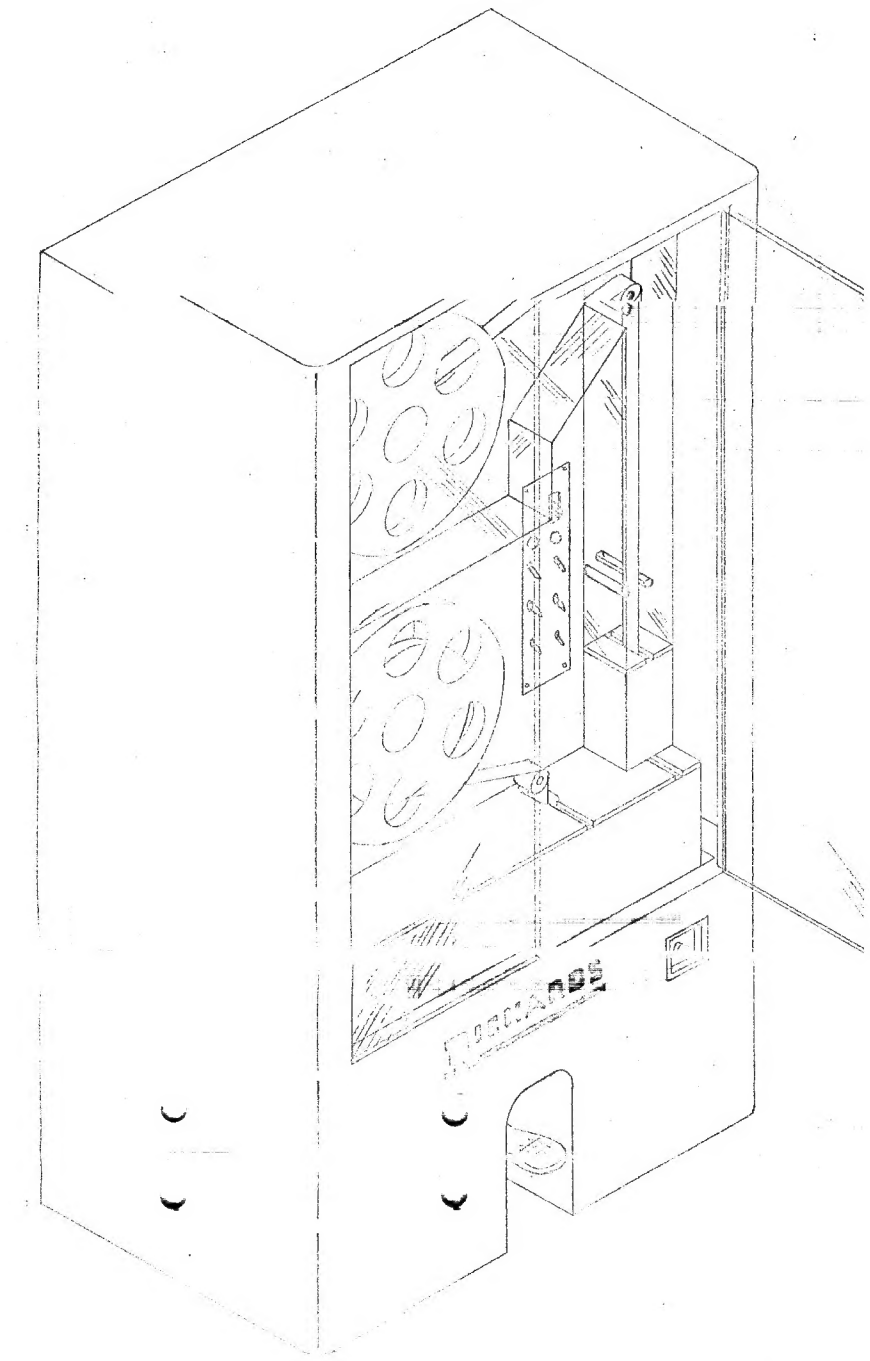
Power required is 115V, 60 cycle, 1 phase, 15 amperes.

7. Price and Delivery

The Model CT-4R Microfilm and Tape Cleaning Machine is $12,500.00 FOB your destination, including two days of installation check-out and instruction of your operating and maintenance personnel by our representative. Terms are less 1% for 10 day payment, net 30 days. Delivery can be made in 150 days after receipt of order under our current schedules.

8. Warrantee

This equipment is fully warranted against defects of materials and workmanship for a period of 90 days after acceptance. This warrantee covers the cost of repair or replacement of defective components at our discretion, but assumes no liability for any damage to any material not supplied as part of this equipment. Warrantee is void if equipment has not been properly maintained or serviced, or if solvents other than those specifically recommended by The Richards Corporation have been used.



DESCRIPTION	NO. REQ.
PROJECT	
Micro film + Tape Archive	
RADS CORPORATION	
Arlington, Virginia	
DRAWN BY: MRK DATE: 8-8-67	
CHECKED BY: DATE:	
C-12183	

CT-4K
MICROFILM AND TAPE
ARCHIVING MACHINE
RICHARDS CORPORATION